

Running head: POSTOPERATIVE PAIN MANAGEMENT

Postoperative Pain management in Ambulatory Surgery

Research Paper

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## Abstract

The purpose of this study were to determine whether the type and amount of narcotic administered in the Post Anesthesia Care Unit (PACU) are associated with the length of stay and the postoperative pain level and intensity, as reported by the patient at the time of discharge to home for patients who have undergone a laparoscopic cholecystectomy. Data will be compiled in a retrospective chart review, and statistical analysis of the data will be evaluated to determine if patients are being discharged to home without meeting same day surgery discharge criteria.

The chart review will compare type and amount of narcotic administered in PACU and ambulatory surgical unit (ASU) following surgery, as well as, the pain level and intensity using measurable variables from the different selected groups of the study.

## Chapter I

*Introduction*

With the ever-increasing budget constraints faced by health care systems today, there is a great push to do more with less. One area where this is very apparent is in the use of same day surgery, or ambulatory surgery.

Ambulatory surgery is a system of surgical care where a patient is admitted to a hospital, medical center, or surgical clinic on the day of his or her electively scheduled surgery. The surgery is performed, and the patient is discharged home within a few hours after the surgery. Technological advances in both surgical procedures and anesthetic techniques have gone hand in hand with cost containment incentives to try to make the ambulatory surgery process more efficient, and more profitable.

*Statement of the Problem*

Ambulatory surgery units/centers are a vastly growing surgical option for people seeking elective and same day surgeries. Ambulatory surgery units/centers are cost effective in today's health care systems. Surgeries are performed on the same day the patient is discharged to home, within hours after surgery. Ambulatory surgery patients' level and intensity of postoperative pain and the length of stay after surgery are criteria for the patients' discharge to home. These criteria are

sometimes not met and the patient may be sent home with higher levels and intensity of pain than anticipated or may have increased length of stay at the surgery unit/center.

#### *Purpose of the Study*

The purpose of this study is to determine whether the type and amount of narcotic administered in the Post Anesthesia Care Unit (PACU) are associated with the length of stay and the postoperative pain level and intensity, as reported by the patient, at the time of discharge to home for patients who have undergone a laparoscopic cholecystectomy.

#### *Research Questions*

1. Is the type of narcotic administered in the PACU associated with the length of stay in the ambulatory surgery center for patients who have undergone a laparoscopic cholecystectomy?
2. Is the amount of narcotic administered in the PACU associated with the length of stay in the ambulatory surgery center for the patients who have undergone a laparoscopic cholecystectomy?
3. Is the type of narcotic administered in the PACU associated with the postoperative pain level and intensity, as reported by the patient at the time of discharge to home,

for the patients who have undergone a laparoscopic cholecystectomy?

4. Is the amount of narcotic administered in the PACU associated with the postoperative pain level and intensity, as reported by the patient at the time of discharge to home, for the patients who have undergone a laparoscopic cholecystectomy?

#### *Conceptual Framework*

This study will use Dorothea Orem's Self-Care Deficit Theory of Nursing, which is a general nursing theory (Orem, 1995). A very simplified, three part explanation of this theory is as follows: (a) during the course of life, individuals must actively pursue specific self-care activities in order to promote and maintain health and well-being; (b) if a person is incapable of meeting these needs, a self-care deficit results; (c) when a person has a self-care deficit, the nurse may compensate for the deficit by providing care to the person.

These three major components of the theory are expanded upon by Orem. Orem (1995) explains these three related theories as layers, which, when combined, encompass her general self-care deficit theory of nursing. The three related theories are: (a) the theory of self-care, which explains



self-care concepts; (b) the theory of self-care deficit, which explains why nursing care can help people and (c) the theory of nursing systems, which explains what relationships must occur for nursing to be produced (Orem, 1995).

The theory of self-care is the central idea of Orem's (1995) theory of nursing. It states that self-care is a human regulatory function that must be performed in order to maintain life, health, physical well being, and mental development. Someone else, as a dependent care, may perform by oneself or self-care. Self-care must be a learned and willfully practiced on a continuous basis. It presupposes that (a) mature and maturing persons learn and develop the skills essential for the maintenance of themselves and their dependents; (b) self-care requires the availability and use of resources for determining what care is needed and how it is provided; (c) self-care varies within families, cultural groups, and societies; (d) individuals vary in their application of self-care based on their willingness to act; (e) personal experience in the use of self-care allows the accumulation of experimental knowledge about types of care, when care is needed, and how care is provided and (f) scientific knowledge is incorporated into experiential

knowledge about self-care and dependent-care within communities.

The theory of self-care deficit is the next layer in the general Self-Care Deficit theory of nursing (Orem, 1995). This theory explains why people require nursing. The central idea of the theory is that persons require nursing when their own ability to provide self-care or care for their dependent is wholly or partially impeded. It presupposes that (a) self-care must be performed in both stable and changing environments; (b) self-care is affected by the value attached to the care measure with respect to life, health, physical well-being, and mental development; (c) the quality and completeness of self-care and dependent care is determined by the culture, scientific achievement, and the ability of the family or group to be educated; (d) participation in self-care and dependent-care are affected by the person's limitations in what to do and how to do it in specific situations; (e) society aids institutionalized persons; (g) helping operations of groups may be categorized into age-related dependency or non-age related dependency; (h) health services may be instituted in groups irrespective of age and (I) Western civilization includes nursing as one of the health services (Orem, 1995).

The last layer in the Self-Care Deficit Theory of Nursing is the theory of nursing systems. This theory establishes the structure and content of nursing practice. The central idea proposes that nurses make all nursing systems for individuals or groups requiring nursing care. It presupposes that, (a) nursing is a practical, human health service; (b) nursing is an art and nurses use intellectual abilities to design and produce nursing for others; and (d) nurses seek results which provide care and assist the recipient in moving toward health or well-being (Orem,1995).

One of the major tests of a nursing theory is its ability to be translated into practice. While Orem's (1995) general theory is very complex, it has been shown to be useful in nursing practice when nurses are providing care for individuals who have health related self-care deficits (Orem, 1995). Vasquez (1992) explains how theoretical basis for delivery of nursing care provides valuable direction in the ambulatory surgery setting. She explains how Orem's (1995) theory is particularly useful because one of the main goals of ambulatory surgery is to promote self-care as soon as possible. Self-care deficits that are created during surgery and anesthesia must be overcome before the person may be discharged home.

Orem (1995) describes three different types of nursing systems: wholly compensatory, partly compensatory, and supportive-educative. All three systems are found at work in the case of a person undergoing an ambulatory surgical procedure.

At the time of admission, prior to surgery, the nursing system that is employed is the supportive-educative system. The patient is capable of providing their own self-care, but requires intervention by nurses for support, guidance, and teaching (Orem, 1995). As the admission process continues, the nursing system shifts to the partly compensatory nursing, where both the nurse and patient perform self-care measures. Orem (1995) describes one such form of partly compensatory nursing as the patient performing universal measures of self-care, while the nurses perform medically prescribed measures and some universal measures. The nurse must compensate for the limitations on the patient's self-care ability.

Once the patient is transferred to the operating suite, he or she moves toward the wholly compensatory nursing system, as the patient must increasingly rely on the nurses for even basic self-care needs. During the intra-operative period, the patient is entirely in the wholly compensated nursing system because he or she is unconscious, heavily sedated, or

immobilized (Kam & Werner, 1990). The nurse must provide for the patient's therapeutic self-care, compensate for the patient's inability to engage in self-care, and support and protect the patient (Orem, 1995).

The wholly compensatory system continues throughout the surgery and into the PACU, where it gradually becomes partly compensatory as the patient emerges from anesthesia. At this point, the nurse should provide the self-care needed by the patient in such areas as relief of pain, nausea, vomiting, and anxiety. The more involved the patient is in his or her own care, the better the patient outcome will be in terms of increased patient satisfaction, decreased complication rates, improved recovery time, and less pain and distress (Learman, 2000).

When the patient is returned to the ambulatory post operative stay area, the nursing system gradually shifts back to the supportive-educative system in order for the patient to meet discharge criteria, where the patient is expected to be self-sufficient and able to provide his or her own self-care as soon as possible. Family members may assist the patient after discharge, but the role would be as dependent-care. Orem (1995) acknowledges that only professional nurses actually use nursing systems, by virtue of their knowledge and education.

Nursing care may still be accessible through community-based agencies, but that would also be classified as nursing consultation (Vasquez, 1992).

Orem's Self-Care deficit Theory of Nursing provides an excellent fit for this study. The purpose of this study is to look at the type and amount of narcotic administered in the PACU and its association with the length of stay in the ambulatory surgical center for a select group of patients. This question, when applied to the self-care deficit theory of nursing, is evaluating whether a postoperative patient's ability to return to self-care is associated with a medically prescribed measure, implemented by a nurse, during the partly-compensatory period of recovery.

#### *Definition of Terms*

The terms that were used in this study were defined conceptually and operationally.

#### *Narcotic*

Conceptual: an Opioid substance used to block pain receptors and relieve somatic pain.

Operational: an Opioid medication given to a patient for the relief of pain.

*Length of Stay*

Conceptual: total time patient spends in the ambulatory surgical unit upon discharge to home, following surgery.

Operational: total time spent in the ambulatory surgery unit from start of admission to discharge following same day surgery.

*Pain Intensity*

Conceptual: an unpleasant sensory and emotional experience arising from actual or potential tissue damage.

Operational: severity of pain described by the patients and measured by using tools of measurement, which results in the administration of an analgesic.

*Laparoscopic Cholecystectomy*

Conceptual: abdominal laparoscopic assisted removal of the gallbladder.

Operational: Removal of the gallbladder by laparoscopic.

*Ambulatory Surgical Patients*

Conceptual: patients undergoing surgery and returning home following surgery in the same 24 hour period.

Operational: patients undergoing surgery on the same day of discharge to home.

*Assumptions*

1. If pain medications are given to a patient, then that patient is experiencing pain.
2. Self-Care is a learned process.
3. If there is no note on a patient chart, stating the patient has pain or there is no analgesic medication given, then the patient has no pain.
4. All patients will experience a similar type of pain following laparoscopic cholecystectomy.
5. Although surgeon technique and length of procedure may vary, this will not have a significant impact on the study results.

*Limitations*

The limitations of this study were:

1. The pain tolerance of each patient may have been different.
2. Only the immediate presence or absence of postoperative need for narcotic analgesia in the recovery room was measured. Any pain experienced beyond this period of a few hours was not measured.
3. The study is limited to one small community hospital ambulatory surgical unit.



4. The study was retrospective, which limits the data available to that which is contained on the patient chart.

### *Summary*

This chapter has examined the concept of ambulatory surgery, its history, and the current trends of the use of ambulatory surgery to optimize health care dollars and increase patient satisfaction during the period surrounding surgery. It has examined the question of pain control in the post-anesthetic care unit and its association with the length of stay in the ambulatory surgical unit. Orem's Self-Care Deficit Theory of Nursing provided the framework for the study, which used the wholly and partially compensatory system of nursing in the post-anesthetic care unit to provide post-operative pain control for the patients undergoing a laparoscopic cholecystectomy.

## Chapter II

*Literature Review**Introduction*

Numerous studies have been conducted to determine the most effective type of postoperative analgesia. Considerations of these studies include not only analgesia, but also side effects such as nausea, vomiting, respiratory depression and sedation. Narcotic analgesia have traditionally been used for postoperative pain relief. However, with a trend toward outpatient surgery and decreased length of hospital stay and same day surgeries, this class of medications may not be the most practical analgesic. Before the investigation of narcotics administered in Post Anesthesia Care Unit (PACU) and the association with length of stay following same day surgery, a review of the literature was conducted. The review included twelve relevant research studies related to this subject.

*Purpose of study*

The purpose of this study is to determine whether the type and amount of narcotic administered in the Post Anesthesia Care

Unit (PACU) is associated with the length of stay and the postoperative pain level and intensity, reported by the patient, at the time of discharge to home for patient's who have undergone a laparoscopic cholecystectomy.

#### *Research Questions*

1. Is the type of narcotic administered in the PACU associated with the length of stay in ambulatory surgery center for patients who have undergone a laparoscopic cholecystectomy?
2. Is the amount of narcotic administered in the PACU associated with the length of stay in the ambulatory surgery center for the patients who have undergone a laparoscopic cholecystectomy?
3. Is the type of narcotic administered in the PACU associated with the level and intensity of postoperative pain reported by the patient at the time of discharge to home for the patients who have undergone a laparoscopic cholecystectomy?
4. Is the amount of narcotic administered in the PACU associated with the level and intensity of postoperative pain reported by the patient at the time of discharge to home for the patients who have undergone a laparoscopic cholecystectomy?

## *Literature Review*

### *Problem*

Researchers note that it is important to have an ambulatory surgical patient ready for discharge to home before the next patient is released from the Post Anesthesia Care Unit (PACU). Therefore, it is necessary to look at the PACU procedures to try and determine whether any causality exists between treatment methods in the PACU and the readiness of the patient to be discharged to home from the Ambulatory surgery center. One of the factors in the PACU is the administration of narcotic analgesics. Narcotic analgesics help control postoperative pain but may also have side effects such as drowsiness and nausea that may prevent the patient from reaching their targeted discharge time.

### *Purpose*

The purpose of the study is to determine whether the type and amount of narcotic administered in the PACU is associated with the length of stay in the ambulatory surgery unit for patients undergoing a dilatation and curettage (Taylor, 2002).

### *Framework*

The study was conducted using Dorothea Orem's Self-Care Theory of Nursing as a theoretical framework.

Population, Sample and Setting

A systematic sample of 190 patients was selected by generating a computerized list of all patients undergoing a dilatation and curettage in a one month period. The selection criteria were as follows: 18 years of age or over, ASA class 1, 2, or 3, Surgical procedure of dilatation and curettage, and Body Mass Index (BMI) between 18 and 36. Exclusion criteria of subjects, as determined by notation on the patient's chart were as follows: Intra-operative complications, Post-operative complications, such as shivering, which were relieved by medication, prolonged nausea and vomiting, or bleeding, a history of psychiatric disorder, mental retardation, mental impairment, or mental disability, and patients who were not discharged to home post-operatively.

The researcher assigned patients in the study to 4 groups. Group 1 received no medication in PACU. Group 2 received the equivalent of 1mg to 5mg of Morphine sulfate in the PACU. Group 3 received the equivalent of greater than 5mg of Morphine Sulfate in the PACU and group 4 received analgesic tablets by mouth (Taylor, 2002).

Instruments

The data collection form, developed by the researcher, retrieved the necessary information from the systematic random

sample of patient charts. A pilot study was completed using five randomly selected charts, within the study sample parameters, to determine whether the form adequately met the research requirements. The data were collected by reviewing the following sections of the patient charts: discharge summary, nursing admission assessment form, physician's orders, operating room (OR) record, anesthetic record, PACU record, ambulatory surgery summary, and any other medication forms (Taylor, 2002). The measured variables collected included: hospital number, age, weight, ASA class, type of anesthesia agents given, BMI, time entering OR, start/finish time of surgeon, time out of OR, time entering PACU, level of consciousness on entering PACU, notation of presence of pain in PACU, presence of complications in PACU, administration of medications (including time, name, route, dosage, and effect), time of discharge from PACU, total time spent in PACU, time of admission to ambulatory surgery discharge area, notation of presence of pain in discharge area, presence of complications in discharge area, administration of medications (including time, name, route, dosage, and effect), time of discharge from discharge area, total time spent in ambulatory surgery center. Also, it was noted if delays were recorded in discharge from either PACU or discharge area, and for what reason (Taylor, 2002).

The data were collected in the medical records department, using the data collection form and chart review. The demographics were collected, as were the length of stay in both PACU and discharge area. ANOVA was used to determine the relationship between the groups that did or did not receive narcotic analgesics in PACU and the discharge area. ANOVA was also used to determine the relationship between the group's length of stay in PACU and the discharge area (Taylor, 2002).

There were 100 subjects in group 1 and 30 each in group 2, 3, and 4 for a total of 190 subjects. Analysis of variance was performed to observe for a relationship between groups and variables to see if there is a difference among the groups.

### Findings

The results show that there is a statistically significant difference in age ( $F=0.5015, p=0.002, df=3, 186$ ), BMI ( $F=3.04, p=0.03, df=3, 186$ ), narcotic ( $F=121.88, p=0.00, df=1, 58$ ), and PACU time ( $F=34.73, p=0.00, df=3, 186$ ). Group 1 had the shortest mean PACU time and group 3 had the longest mean PACU time. The results show that there is no statistically significant difference in weight ( $F=2.32, p=0.076, df=3, 186$ ), ASA ( $F=0.33, p=0.80, df=3, 186$ ), OR time ( $F=2.34, p=0.075, df=3, 186$ ), anesthetic time ( $F=1.84, p=0.141, df=3, 186$ ), surgical time ( $F=1.73, p=0.161, df=3, 186$ ), and time in discharge

area ( $F=0.39, p=0.76, df=3, 186$ ) based on the group. T-tests were performed to compare the means of various groups. The results showed there was no correlation between OR time and time in PACU ( $F=0.09, p=0.23$ ) and time in the discharge area ( $F=0.04, p=0.55$ ). The results showed that there was no correlation between anesthetic time and time in PACU ( $f=-0.05, p=0.53$ ) and time in discharge area ( $F=0.04, p=0.56$ ). The results showed that there was no correlation between surgical time and time in PACU ( $F=0.03, p=0.70$ ) and time in the discharge area ( $F=0.03, p=0.67$ ). There is no correlation between PACU time and discharge area time ( $F=0.01, p=0.90$ ). There is no correlation between PACU time and the amount of narcotic ( $F=0.07, p=0.62$ ). There is no correlation between the amount of narcotic and any of these other variables: age, weight, ASA class, BMI, OR time, anesthetic time, surgical time, PACU time, and ASU time (Taylor, 2002).

The first research question was, "Is the type of narcotic administered in the PACU associated with the length of stay in the ambulatory surgery center to patients undergoing a dilatation and curettage?" analysis of the data showed no correlation between the type of narcotic administered in the PACU and the length of stay in the ambulatory surgery center. The second research question was, "Is the amount of narcotic



administered in the PACU associated with the length of stay in the ambulatory surgery center for patients undergoing a dilatation and curettage? Data analysis showed no correlation between the amount of narcotic administered in the PACU and the length of stay in the ambulatory surgery center (Taylor,2002).

The study used a systematic random sample of patient charts generated through the surgical department computer program to select patients who had undergone a dilatation and curettage under general anesthetic as an ambulatory surgical case. Data were collected in the medical records department by the researcher using a tool developed by the researcher. The data was limited to what was available on the patient charts, but by using a retrospective chart review, it eliminated the potential for bias in the administration of analgesics and in discharge times for the patients. The major dependent variable in the study was the length of stay in the ambulatory surgery center. The major independent variables of the study were the type of narcotic administered in the PACU and the amount of narcotic administered in the PACU.

### Conclusions

The results of the study showed that the dependent variable is not associated with the independent variables. The study results showed the mean amount of narcotic administered in PACU

was 3.238mg, with a standard deviation (SD) of 0.764, in group 2 and 7.390mg with a SD of 1.913, in group 3. The maximum amount of narcotic administered to any subject in the group was the equivalent of 10mg of Morphine Sulfate. The results may vary with greater doses of narcotics due to the inherent side effects of the narcotic, such as drowsiness and nausea. Ambulatory surgical units are trying to improve the efficiency and productivity in health care systems. This study did not provide a way to accomplish efficiency and productivity; it does show that the administration of narcotic analgesics in the PACU does not hinder the process.

### Problem

The traditional treatment of postoperative pain with narcotic analgesics can cause sedation, respiratory depression, nausea, and vomiting. Nonsteroidal anti-inflammatory drugs (NSAID's) may offer a significant advantage in treating postoperative pain because this class of drug does not produce these adverse side effects. Ketorolac provides analgesia and is one of a few NSAID's approved for parenteral administration. Unlike opioids, Ketorolac is not associated with tachyphylaxis, withdrawal symptoms, or respiratory depression. It can, therefore, be used as an alternative to opioids in the management of postoperative pain (Lenihan, 2000).

Although many studies have been done in the area of postoperative pain management, few studies have specifically focused on the use of Ketorolac following laparoscopic cholecystectomy.

### Purpose

The purpose of this study was to determine if the amount of narcotics required postoperatively was significantly less when Ketorolac was administered intraoperatively than when no Ketorolac was administered for laparoscopic cholecystectomy. This NSAID may decrease postoperative pain without the adverse side effects associated with narcotic analgesics.

### Framework

Hans Selye's (1978) General Adaptation Syndrome is the theoretical framework that guided the research by providing an understanding of the physiological mechanisms associated with the body's response to painful stimuli. There are three stages of stress response in Selye's General Adaptation syndrome. The first stage is the alarm stage and is the fight or flight response. This is the stage that occurs when the body is first submitted to pain stimulus during surgery. The use of Ketorolac provides anti-inflammatory and analgesic effects by blocking the chemical reaction of the fight or flight stage. The second stage is the resistance stage. In this stage the autonomic nervous

system takes control and returns the body to a normal state by adapting to the stressful stimuli and uses energy for the adaptation. The third stage is the exhaustion stage. If the body's energy supply is depleted, signs of the alarm stage reappear. The stressor overpowers the body's adaptive reactions and the condition may become a threat to life. Pain in the body is a protective mechanism that signals tissue damage (Lenihan, 2000).

#### Population, Sample and setting

The study population consisted of subjects selected from a population of Health Maintenance Organization (HMO) Patients who had undergone laparoscopic cholecystectomy and met the studies inclusion criteria. This was a sample of convenience with a total of 51 subjects selected (N=51). The subjects were assigned by convenience on the basis of their membership in one of two groups, those who received intraoperative Ketorolac and those who did not receive intraoperative Ketorolac.

The first 51 patients who met the following selection criteria were admitted to study: age of 18-65 years of age, classified as either ASA 1 or ASA 2, elective laparoscopic cholecystectomy, and received a total dose of 30mg intraoperative Ketorolac, either 30mg intravenously or 15mg intravenously and 15mg intramuscularly, which were the

experiment group. The exclusion criteria for the study included the following: patient with known history of allergy to NSAID's, emergency procedure, history of gastrointestinal bleeding, ulcers, coagulopathy, liver disease, asthma or renal dysfunction, received intraoperative agonist/antagonist, received greater than 8mg/kg of intraoperative Fentanyl, and procedure of open cholecystectomy preformed (Lenihan, 2000).

### Instruments

The sample size calculations were computed to determine the number of subjects required for each group. The literature suggested the likelihood that persons receiving Ketorolac intraoperatively will require no more than 2mg plus/minus 1mg Morphine Sulfate postoperatively, while patients receiving no Ketorolac could require as many as 4mg plus/minus 1mg Morphine Sulfate in the first hour postoperatively (Parker, Holtmann, & White, 1991). Borenstein and Cohen's (1998) software program for sample size calculations and power analysis was used in conjunction with these group statistics. It was determined that there was an 80% chance that an effect this large could be detected with 25 patients in each group when the alpha level to reject the null hypothesis was set at .05.

In the study, the dosage of postoperative Morphine Sulfate (MS) was the dependent variable that was influenced by

manipulation of the independent variable. The intraoperative administration of Ketorolac (either 30mg intravenously or 15mg intravenously and 15mg intramuscularly) was the independent variable.

A data collection sheet was used to collect information from medical records. Information collected for each subject included height and weight, time of surgical procedure, time of intraoperative administration of Ketorolac, intraoperative narcotics, local anesthetics, or agonist-antagonists administered, and postoperative pain medications administered. The daily anesthesia logbooks were used to identify the patients who had undergone laparoscopic cholecystectomy. The anesthesia record for each patient was then reviewed for all inclusion criteria and administration of any intraoperative Ketorolac. The hospital medical record was then reviewed for preoperative and postoperative medication administration. An independent sample t-test was used to evaluate group differences in the amount of opiate drugs required postoperatively. In this test, the independent variable was the intraoperative use of Ketorolac (yes/no) and the dependent variable was milligrams of MS required postoperatively. A chi-square test was used to determine significant differences between the two groups in relation to preoperative medications received. Variables that

show statistical significance, patient height, and duration of surgery were checked using the nonparametric Mann-Whitney U test. The relationship of each potentially confounding variable and the dependent variable were evaluated with Kendall's tau correlation (Lenihan, 2000).

### Findings

The results of the study showed none of the subjects received intraoperative agonist-antagonists. Each of the subjects received the same local anesthetic at the surgical site. There was a statistically significant difference in the length of time patients spent under anesthesia ( $t=2.44, df=49, p<.019$ ). The Ketorolac patients on average were under anesthesia longer than the control patients. The mean for the Ketorolac patients was 181.9 minutes, while the mean for the control patients was 146.8 minutes. There was no statistically significant difference between the groups on any of the other potentially confounding variables. Since these variables were not normally distributed, and since the sample size was small, these results were checked using the nonparametric Mann-Whitney U test. The results confirmed the statistical significance of time under anesthesia ( $U=208.5, p=.028$ ). The duration of surgery approached statistical significance in the analysis ( $U=221.5, p<.051$ ). The mean duration of surgery for Ketorolac

patients was 108.0 minutes and the mean for the control patients was 90.4 minutes. The results of the two groups who were administered preoperative medications indicated from a chi-square test that there was no significant difference between the groups. The study also showed there was no significant difference between the patients who received preoperative medications and those who did not and the use of either group receiving postoperative analgesics.

The central focus of the study is the relationship between the intraoperative use of Ketorolac during a laparoscopic cholecystectomy and the amount of postoperative narcotic analgesics needed to alleviate pain. A comparison of the 26 patients who received Ketorolac with 25 patients who did not indicated that the groups were either significantly different, or nearly significantly different on three potentially confounding variables: duration of anesthesia, duration of surgery, and height. Therefore, each of these three variables was statistically controlled in the evaluation of the effect of Ketorolac on postoperative analgesic use. This was accomplished by using an analysis of covariance. The results of this analysis indicates the duration of anesthesia  $F=0.01$ , duration of surgery  $F=0.03$ , and height  $F=1.26$ . As the  $F$  scores indicate, none of the covariates were observed to be significantly associated with the



dose of postoperative MS received. Each of the covariates was controlled in the analysis of the impact of Ketorolac on the postoperative MS requirements. That is, the effects of the covariates were removed statistically before the impact of Ketorolac on postoperative MS dose was evaluated. In a comparison of patients who received intraoperative Ketorolac with those who did not, there was a statistically significant difference in the amount of analgesic received ( $F=11.05, p<0.002$ ). The mean dose of postoperative MS for the Ketorolac group was 2.1mg, while the mean dose of postoperative MS for the nonketorolac group was 5.4mg of MS administered. The patients receiving intraoperative Ketorolac required significantly less postoperative MS for pain relief than patients who did not receive intraoperative Ketorolac. None of the potentially confounding variables used as covariates in the analysis were found to be significantly related to postoperative analgesic use when they were included in the same analysis with Ketorolac use (Lenihan, 2000).

### Conclusion

As same day surgery becomes an increasingly common and cost-effective option, health care providers are considering different strategies for improved postoperative pain management without side effects and sedation that may prolong discharge to

home. This study showed a reduction in the total dose of postoperative MS administered in PACU to subjects who received intraoperative Ketorolac during laparoscopic cholecystectomy versus those subjects having the same procedure who did not receive intraoperative Ketorolac.

### Problem

Patients undergoing ambulatory surgery may face additional fears and anxiety during the perioperative period than inpatient hospital scheduled surgeries. Preoperative teaching for the ambulatory patients is usually done by telephone the day prior to surgery and the day of surgery during the admission process. The postoperative period is also a brief period of time for the patient. This limited time and contact with the nurses often results in problems with communication and continuity and coordination of care. The limited time with admission and discharge nurses often leaves patients and their families feeling dissatisfied with care given and anxious about recovery expectations. However, if nurses are to design meaningful interventions for the care of ambulatory surgery patients and to develop ways to ease patients' anxiety and concerns during the ambulatory surgery experience and their transition at home, patients' perceptions of ambulatory surgery need to be identified (Costa, 2001).

### Purpose

The purpose of this study was to explore ambulatory surgery patients' perceptions of the perioperative experience and to address the essence of the perioperative experience as perceived by patients who have undergone ambulatory surgery (Costa, 2001).

The author of this study included a short literature review of several studies conducted that focused on preoperative and postoperative preparation, pain management and patient satisfaction. Several of the studies reviewed showed a correlation between ambulatory surgery and lower satisfaction rates based on the four areas focused in the review. The author followed the literature review with the study conducted and the findings of the study.

### framework

The study used a hermeneutic phenomenological approach to explore and provide an understanding of the essence of the perioperative experience as perceived by patients who had undergone ambulatory surgery.

### Population, Sample and Setting

The convenience sample consisted of thirteen women and three men (n=16) whose ages ranged from 26 to 69 years of age. There were no other descriptions of the sample identified in the study. The sample was recruited from patients who had undergone

abdominal surgery under general anesthesia and were discharged to home the same day.

The study was conducted at an ambulatory surgery department in a large teaching hospital in the northeast region of the United States.

### Instrument

Patients were interviewed one week after undergoing surgery. A semi structured interview guide provided direction for the interview. Probes were used to elicit further information or to pursue the development of pertinent themes. The interview guide contained open-ended questions about what it was like to undergo ambulatory surgery. The interview guide was modified based on the results of a pilot study of three patients and continued to be modified throughout the study (Costa, 2001).

The interviewer asked the participants to recall how they felt the night before surgery, what their experience was like the day of surgery, and whether the actual perioperative experience met their expectations. Additional questions focused on participants' feelings about the discharge process and the experience of recovering at home. To uncover overall perceptions of the experience, the interviewer asked participants how they would prepare a friend who may be seeking to undergo ambulatory surgery.

Analysis was aimed at achieving understanding of the lived experiences of ambulatory surgery patients. Analysis of each interview began from the interview transcripts. The insight into the essential meaning of the interviews involved a process of phenomenological reflection.

### Findings

In reflecting on participants' lived experiences, the thematic aspects of the phenomenon were analyzed. These themes became the structure of the experience (Costa, 2001).

Three common themes emerged from the patient interviews—fear, knowing, and presence. Fear was described as fear of death from anesthesia, fear of loss of control, and fear of being cut. Knowing was described in terms of the nurse and family members being available physically and emotionally to the patient (Costa, 2001).

### Conclusion

The theme most often emerged was the fear of death from anesthesia. Understanding this fear sensitizes nurses to patient cues and helps the nurse to develop interventions to allay patients' fears. The theme of not knowing suggests patients preoperative and postoperative education needs to be reviewed and possibly revised by the nurse and physician. The importance of the presence of nurses and family was articulated throughout

the study. Nursing intervention requiring perceptive communication and genuine empathy can be implemented. Allowing patients and family members to remain connected throughout the perioperative experience is a powerful nursing intervention and one that the nurses in the ambulatory surgery settings can implement (Costa, 2001).

### Problem

According to Roberge (1997), the perioperative experience for both the patient and families in the past was dealt with in a more stringent manor. Patients undergoing the repair of an inguinal hernia fifteen years ago were admitted to the hospital, given a spinal or general anesthetic, and then kept as an inpatient for up to four days. Today, the inguinal herniorrhaphy is one of the most commonly performed outpatient procedures. Through the use of local anesthesia and knowledge of better pain management measures, the inguinal hernia repair requires much less recovery time; less, if any, hospitalization and is therefore more cost effective, as well as, more comfortable for the patient. Because these patients will be cared for at home following outpatient surgery, they should be as free as possible from postoperative complications including pain. It has been shown that the use of local anesthesia during hernia repair can provide an extended period of pain relief following surgery. If

pain is preempted by local anesthetic blockade, both postoperative pain and postoperative narcotic requirements are reduced (Roberge, 1997).

### Purpose

The purpose of this study was to determine if intraoperative local anesthesia, specifically bupivacaine, improved control of postoperative pain, and to explore the relationship between general anesthesia without local anesthesia, and postoperative pain.

### Framework

The Gate-Control Theory of Pain, as presented by Melzack and Wall (1965), formed the theoretical base for this study. The Gate-Control theory consists of three spinal cord systems, which transmit nerve impulses when stimulation of the skin has occurred. The gate-control system consists of the substantia gelatinosa, which acts as a gate that modulates the synaptic transmission of nerve impulses from peripheral fibers to transmission cells through an action system. Small diameter fibers are responsible for excitatory effects of arriving impulses in the substantia gelatinosa, and large diameter fibers are responsible for inhibitory effects of arriving impulses in the substantia gelatinosa. Although input is processed in the substantia gelatinosa before it is transmitted to the brain,

cognitive control is believed to contribute in some way to the inhibitory effects of large diameter fibers. In the afferent input system there are three features which are important in explaining pain: the relative balance of activity in large versus small fibers, the stimulus-evoked activity, and the ongoing activity, which precedes the stimulus. As long as impulses are being transmitted via small diameter fibers and there is no large diameter fiber activity, the gate is held in a relatively open position. When large diameter fibers stimulated, there is a counteraction effect on the impulses and the presynaptic gate will be partially or completely closed. Sensory input is modulated at successive synapses throughout its projection from the spinal cord to the brain areas responsible for pain experience and response. Pain occurs when the number of nerve impulses that arrive at these areas exceeds a critical level. Prior to surgery, before an incision has been made, the gate-control system lies undisturbed. The gateway of pain from small diameter fibers has not been opened. When peripheral nerves are cut, an electrical impulse is produced which travels to the spinal cord and on to the brain, producing a pain response. Theoretically, this impulse could be delayed and minimized for hours through the use of a long-acting local anesthetic blockade such as a bupivacaine injection at the



surgical site. By stopping pain perception at its source, the actual impulse to the spinal cord is greatly reduced, and the transmission to the brain is minimal to none. In other words, local anesthetic blockade keeps the gate largely closed. This is the hallmark of preemptive pain management.

#### Population, Sample and Setting

The target population of the study was male adults undergoing inguinal herniorrhaphy. The sample was drawn from patients who have had surgery at the surgery center over the past five years. Records of all surgical cases during the time period have been listed into the center's computer. From this list, all male patients who had undergone inguinal herniorrhaphy and received local and general anesthetics were selected. These were subdivided into three groups: those who were anesthetized using lidocaine, those who were given bupivacaine, and those receiving general anesthesia only. Charts from all of the patients meeting the above criteria were examined. The sampling technique utilized was convenience sampling. Convenience sampling uses people who are readily available as subjects in a study. In order to be included in the study, the subjects had to meet the following criteria: adult males age 18 and older, undergone inguinal herniorrhaphy at the surgery center, and

given either local or general anesthesia, but not both simultaneously (roberge, 1997).

### Instruments

A power analysis was done in an ANOVA context in which three groups were compared. An F test alpha at .05 with three groups will yield a medium effect size of .25. With forty people in each group, there will be a 76% probability of picking up a difference among the groups. Therefore, the study had forty subjects in each group (Roberge, 1997).

A survey tool was developed to record chart data specific to the study to ensure confidentiality. Patient and physician names were not included on the forms. The following demographic data was included: assigned code number, age, data of surgical procedure, narcotic used postoperative, if any, length of stay in recovery, type of anesthesia during surgical procedure, i.e., local, local with sedation, or general alone. Also included was the presence of nausea, absence of nausea, and whether or not the nausea was listed on the patient information form. Data collection for completion of the patient information form was then obtained from the medical records department. The program coordinator and investigator reviewed the patient information form for content validity and interrater reliability. The interrater reliability is the degree to which two or more

independent judges are in agreement about observations of events. The information was quantifiable because specific variables were being measured which included the amount of narcotic analgesic used postoperatively, and the length of time in the recovery room. Research obtrusiveness was not an issue because the independent variable had already occurred. There was objectivity because any thorough researcher would be able to arrive at similar scores by looking at these patient records. The two main variables to be measured were the amount of narcotic analgesia that the patient received in the recovery room and the length of stay in the recovery room. All non-morphine narcotic analgesics, such as Demerol, were converted using Opioid Analgesic Equivalences so that all narcotic data would be equal. The comparison was made among those patients who received intraoperative lidocaine, intraoperative bupivacaine, or general anesthesia alone. Descriptive data were used to analyze the population sample using measures of central tendency and measures of variability.

The 120 subjects were divided into three groups: 40 receiving sedation along with bupivacaine, 40 receiving sedation along with lidocaine, and the final 40 receiving general anesthesia with no local anesthesia injected.

Findings

The data showed the mean age of the study group was 54.5 and the amount of local anesthesia use ranged from 0ml to 34ml with a mean of 12.9ml. One third of the subjects received no local at all because they received general anesthesia. Intraoperative narcotic amounts were collected for comparison and were converted to equivalent milligrams (mg) of Morphine Sulfate (MS). These amounts ranged from 0mg to 75mg MS with a mean of 14.7mg MS. Postoperative narcotic amounts ranged from 0mg MS to 28.25mg MS with a mean of 4.14mg MS and a standard deviation (SD) of 6.76. The results are quite skewed. The length of stay (LOS) in the recovery room postoperatively also revealed skewed results. The LOS ranged in minutes from 30 minutes to 260 minutes with a mean of 101.84 minutes and a SD of 62.79 minutes. Finally, of the 120 patients reviewed, only 22 patients reported nausea postoperatively. All 22 of these patients were administered anti-nausea medication. Group zero, who received no local anesthetic, had the following means: amount of intraoperative narcotic 19.91mg MS, amount of postoperative narcotic analgesia 10.64mg MS, LOS 171.07 minutes, and presence of nausea 47%. Group one, who received bupivacaine, had the following mean: amount of intraoperative narcotic 11.75mg MS,

amount of postoperative narcotic analgesia .05mg MS, LOS 60.5 minutes, and presence of nausea 0%. Finally, group two, who received lidocaine, had the following means: amount of intraoperative narcotic 12.42mg MS, amount of postoperative narcotic analgesia 1.76mg MS, LOS 73.95 minutes, and presence of nausea 7%.

The findings for the six research questions are as follows:

- 1) Research question one stated patients receiving incision infiltration of bupivacaine intraoperatively would have a shorter length of stay in the recovery room compared to those patients receiving general anesthesia only. The t-test for independent samples was used to test for the significance between the means of those patient groups receiving bupivacaine versus those receiving no local anesthesia, relating to LOS postoperatively. Using the t-test for independent samples, the LOS for the two groups was statistically significant. The t-value was -13.46 and the probability level was  $p=.000$ , which is very significant. Based on the analysis of the data, the difference in the LOS in the recovery room of patients who received bupivacaine versus no local anesthesia was statistically significant, thus the research question number one was supported.

- 2) Research question two stated patients receiving incision infiltration of bupivacaine intraoperatively will have a decreased need for narcotic analgesia in the recovery room compared to those patients receiving general anesthesia only. The t-test for independent samples was used to test for the significance between the means of those patient groups receiving bupivacaine versus those receiving no local anesthesia, relating to postoperative narcotic anesthesia given. Using the t-test for independent samples, the amount of postoperative analgesia for the two groups was also statistically significant. The t-value was found to be -9.26 and the probability level was  $p=.000$ , which again is very significant. Based on the analysis of the data, the difference in the amount of postoperative analgesia used by patients who received bupivacaine versus no local anesthesia was statistically significant. Thus, research question two was supported.
- 3) Research question three stated patients receiving incision infiltration of bupivacaine intraoperatively will have a shorter length of stay in the recovery room compared to those patients receiving infiltration of lidocaine. The t-test for independent samples was used again to test for the significance between the means of those patient groups

receiving bupivacaine versus lidocaine, relating to length of stay in the recovery room. Using the t-test for individual samples, the LOS for the two groups was not significant. The t-value was -1.78 and the probability level was  $p=.080$  which is not significant at the .05 level. Based on the analysis of the data, the statistical difference in the LOS of patients who received bupivacaine versus lidocaine was not significant; therefore, research question three was not supported.

- 4) Research question four stated patients receiving incision infiltration of bupivacaine intraoperatively will have a decrease need for narcotic analgesia in the recovery room compared to those patients receiving incision infiltration of lidocaine. Using the t-test for independent samples, the amount of postoperative narcotic analgesia for the two groups was statistically significant. The t-value was 2.35 and the probability level was  $p=.024$ , which is significant at the .05 level. Based on the analysis of the data, the difference in the amount of postoperative analgesia used by patients who received bupivacaine versus lidocaine was statistically significant. Therefore, research question four was also supported.

- 5) Research question five states patients receiving incision infiltration of bupivacaine intraoperatively will have a shorter LOS in the recovery room compared to those patients receiving incision infiltration of lidocaine or general anesthesia alone. The one-way ANOVA for more than two means was used to test for significance among those patients receiving bupivacaine, those with lidocaine, and those who had no local at all, relating to the LOS postoperatively. The F test for the ANOVA is very significant at the  $p < .000$  level, a post-hoc Tukey B was run to see which groups were significantly different. By far, the group without local had the most significant difference in LOS. Therefore, research question five was supported.
- 6) Research question six stated patients receiving incision infiltration of bupivacaine intraoperatively will have a decrease need for narcotic analgesia in the recovery room compared to those patients receiving incision infiltration of lidocaine or general anesthesia alone. The one-way ANOVA was used to check for significant difference among the means of the same three anesthesia groups, relating to postoperative narcotic analgesia. The F-test for the ANOVA was again very significant. Another post-hoc Tukey B was run to determine which groups had the most significant



differences. Overwhelmingly, the group who received no local was the most significant group for the use of postoperative narcotic analgesia, thus the research question six was also supported.

### Conclusions

Based on the findings of the study, conclusions were derived, the main purpose of this study was to determine if the intraoperative use of bupivacaine reduced the incidence of postoperative pain in the adult, male patient undergoing inguinal herniorrhaphy as evidenced by the decreased need for narcotic analgesia in the recovery room, as well as, a shorter stay in the recovery room. The findings from n=120 charts indicated that the use of either local anesthetic did reduce the length of stay postoperatively, as well as, decrease the amount of postoperative narcotic given. Bupicaine was superior to lidocaine regarding use of postoperative narcotic, but was not significantly better in reducing length of stay postoperatively. The patients who received lidocaine, however, had very similar LOS to the bupivacaine patients, but their increased need for postoperative narcotic was statistically significant.

The survey tool used in the study showed both interrater reliability and content validity. Not only could any researcher use it and get the same results, but also it was appropriate for

gathering the data needed for the study. The study had some limitations. Because the pain tolerance of each patient may have been different, a larger sample might have provided a better representation. Also, medical regimes may have varied among physicians, so a larger sample size might have decreased sampling error. However, the statistical results were so strong that this sample size, in all probability, was sufficient to show the intended results. During data collection, many subjects were eliminated because the surgeon used a combination of both bupivacaine and lidocaine intraoperatively; the idea being that lidocaine works faster and bupivacaine lasts longer. The inclusion of this group in the study might have affected the results. In addition to postoperative narcotic data being collected, intraoperative narcotic data was collected as well. It was used similarly for general anesthetic patients, as well as, sedation patients and appeared to have little, if any, effect on the results. In fact, the patients who had no local at all, were given the largest amounts of intraoperative narcotic, while still requiring a much greater amount of narcotic postoperatively than those who did not receive local. Therefore, the use of narcotic intraoperatively did not appear to affect the LOS or the amount of narcotic used in the immediate postoperative period. According to the results of this study,

virtually all patients, with either sedation or general anesthetic, would benefit greatly from intraoperative injection of local anesthesia. This information has the opportunity to impact the financial outcomes of patient care and costs to the hospital, while it actually increases quality.

### Problem

Finding new analgesics and alternative analgesic techniques for ambulatory postoperative pain in patients is continually being studied. Sometimes looking at previously researched analgesics can bring newer and refreshed ideas into the framework of analgesic management. Ketamine is a long-standing anesthetic agent. In lower dosages, however, Ketamine may be used as an analgesic adjunctive medication.

### Purpose

This study aims to evaluate efficacy of ketamine as a preemptive perioperative analgesic in low dosages. Ketamine plays an important role in pain transmission by binding to the N-Methyl-D-aspartate (NMDA) receptors as a non-selective antagonist, thereby, reducing hyperalgesia.

### Framework

There was no theoretical nursing framework used in this study.

Population, Setting and Sample

The sample consisted of 40 patients, 14 males and 26 females from a surgical unit in Tokyo. The age range of subjects was between 26-79 years of age. The mean age was 51.65, with a standard deviation (SD) of  $\pm 9.62$ . The inclusion criteria was as follows: age  $> 18$  years old, non obese patient (obese patient=patient weight  $> 30\%$  of ideal weight), ASA class I (n=34), II (n=5), III (n=1), elective surgery, absence of allergies or intolerance to Ketamine and Tramadol, comprehending of Visual Analog Scale (VAS) and Verbal Rating Scale (VRS), and absence of psychiatric illness (past or present). Intraoperative exclusion criteria (drop out) were: intraoperative changeover from laparoscopic to open cholecystectomy, and any severe perioperative complications. The same surgeon performed all of the patients' surgeries. All of patients received the same general anesthesia.

Instruments

Using a randomized double-blind method, the subjects were assigned to one of two groups. Group K was given Ketamine 0.75mg/kg during the removal of the gallbladder, before reversing pneumoperitoneum. Group T was given tramadol 1.5mg/kg at the same sequence of events and the control group T did not

expect a non-analgesic placebo for ethical reasons.

Postoperative analgesia was evaluated using six variables:

- 1) Awakening time in minutes and Elementary Recovery Time (ERT) from extubation
- 2) VAS (0-10)
- 3) VRS (0-5), scale: 0= no pain, 1=mild pain, 2=discomforting pain, 3=distressing pain, 4=horrible pain, and 5=excruciating pain
- 4) Pain Intensity Difference (PID) shows pain relief by subtracting VAS 10 from the pain score at baseline, e.g. VAS of 8 corresponds to a PID of 2
- 5) Adverse effects: hallucinosis, nystagmus, nausea, psychomotor excitation, sedation, hyperalgesia, respiratory depression, hypotension from baseline, bradycardia, and rescue doses of tramadol
- 6) Supplemental doses (mg) (Badano, et al., 2004)

The two groups of patients did not differ in terms of sex, group K had 12 female and 8 male, group T had 14 female and 6 male ( $\chi^2=2.56, p>0.05$ ), group K age 52.25 years versus group T age of 51.05 years ( $F=0.71, p>0.05$ ), weight for group K 71.75kg versus group T 67.3kg ( $F=1.11, p>0.05$ ), ASA for group K, class I, 17 and class II, 3 versus group T for class I, 17, class II 2, and class III 1, ( $\chi^2=2.45, p>0.05$ ) and duration of the surgical

procedure for group K was 72.25 minutes, group T was 72.4 minutes ( $F=0.88, p>0.05$ ). The mean anesthesia time was  $86.92 \pm 18.62$  minutes (range: 45-140 minutes); mean surgical procedure duration was  $78.82 \pm 17.92$  minutes (range: 30-130 minutes). All patients were discharged to home and no patients presented any severe postoperative complications (Badano, et al., 2004).

The Elementary Recovery Time (EST) was  $2.65 \pm 2.35$  minutes (range: 0.5-20 minutes) in the Ketamine group and  $1.01 \pm 0.76$  minutes (range: 0.5-4 minutes) in the Tramadol group. The clinical differences are small and not statistically significant ( $F=1.38, p>0.05$ ). The mean residual pain (VAS) in both groups and at all times was lower than 5. The VAS at awakening was  $1.25 \pm 1.19$ , in the K group and  $1.30 \pm 1.20$  in the T group. The mean VAS constantly decreases in both groups during recorded intervals at the surgery unit. The minimal clinical differences are not statistically significant ( $F=1.89, p>0.05$ ) and show that both anesthetics produce a good postoperative analgesia ( $VAS<5$ ) (Badano et al., 2004).

The analgesia is optimal at the awakening (mean VAS:  $\sim 1$ ), then after 1 hour the mean value is higher (VAS:  $\sim 5$ ), and gradually decrease in the following hours and it almost disappears after 24 hours (mean VAS:  $\sim 1$ ). The pain evaluated through the VRS is lower than 2 (discomforting pain) in both

groups at all times, even if the patients of the Tramadol group present, after one hour, higher and different mean values in respect of the Ketamine group ( $2.2 \pm 0.68$  versus  $1.9 \pm 0.68$ ), this slight clinical difference is not statistically significant ( $F=0.87$ ,  $p>0.05$ ). The VAS shows pain is almost absent at the awakening ( $0.65 \pm 0.61$  versus  $0.7 \pm 0.53$ ), it increases after one hour ( $1.9 \pm 0.68$  versus  $2.2 \pm 0.68$ ), then constantly decreases in the first hour ( $1.7 \pm 0.53$  to  $1.35 \pm 0.52$  in group k and  $1.6 \pm 0.52$  to  $1.3 \pm 0.52$  in the T group and it is almost absent after 24 hours ( $0.6 \pm 0.45$  versus  $0.9 \pm 0.42$ ), clinical differences are not statistically significant. The PID confirms what was stated before:

postoperative analgesia was excellent in both groups at the awakening ( $8.00 \pm 1.40$  versus  $8.40 \pm 1.20$ ), but presents short duration (after 1 hour PID:  $5.25 \pm 1.47$  versus  $6.65 \pm 0.90$  versus  $6.65 \pm 1.63$  after 3 hours;  $7.05 \pm 1.28$  versus  $7.4 \pm 1.01$  after 6 hours) and it is again excellent after 24 hours ( $9.1 \pm 0.5$  versus  $8.6 \pm 0.89$ ); the slight clinical differences are not statistically significant ( $F=1.56$ ,  $p>0.05$ ).

The averages of the supplemental doses Tramadol (rescue doses) was  $50 \pm 38.09\text{mg}$  in the Ketamine group and  $62.5 \pm 29.75\text{mg}$  in the Tramadol group; 8 patients of the Ketamine group and 3 patients of the Tramadol group didn't require any rescue

dose; this shows that preemptive Ketamine upgrades postoperative analgesia (Badano, et al., 2004).

Adverse effects occurred in 17 patients of the Ketamine group (42.5% of the whole patients) and in 7 patients of the Tramadol group (17.5%). The occurrence of adverse effects is high in the Ketamine group (17/20 patients) and medium in the Tramadol group (7/20 patients); but whereas some of the adverse effects due to Ketamine (hallucinoses, nystagmus, excitation, photophobia) are psychotic events, the adverse effects of the tramadol group are unpleasant (hyperalgesia, nausea) and could have a dangerous influence on the cardiopulmonary function (respiratory depression and hypotension) (Badano, et al., 2004).

### Findings

Performing this study and analyzing literature, the researchers' first clinical question was, "Can Ketamine be administered as postoperative analgesic?" according to the results of this study, the answer was yes. Ketamine dosage of 0.7mg/kg intravenous and perioperative timing (during gallbladder removal) ensured a good postoperative analgesic according to the patient's statistical analysis. The second clinical question in this study regarded the adverse effects ascribed to both analgesic drugs and laparoscopic surgery or to the administration of Ketamine or tramadol. According to the



study, the adverse effects resulting from the administration of Ketamine was not as dangerous as that of Tramadol. Ketamine and Tramadol both as anesthetics, have adverse effects, however, the administration of benzodiazepines could minimize the effects of psychotic adverse reactions. Ketorolac Tromethamine administered with Tramadol may reduce the incidence of respiratory depression and the administration of Zofran preemptively may also reduce the occurrence of postoperative nausea (Bandano, et al., 2004).

### Conclusion

The conclusion of this study and recommendations continue to support the hypothesis that low doses of Ketamine can provide good postoperative analgesia and enhance Tramadols efficacy preemptively. Benzodiazepines and anti-emetics administered intraoperatively may help reduce Ketamine's adverse effects (Badano, et al., 2004).

### Problem

Non-Steroidal Anti-inflammatory Drugs are often used with other Opioid compounds for pain control because NSAIDs do not have the side effects that are related to opioid compounds. Opioid related side effects may delay the hospital discharge for same day laparoscopic cholecystectomy (Bayindir et al., 2006).

Purpose

This study is a double-blind, randomized, controlled study that is comparing the efficacy, tolerability and Morphine-sparing effects of lornoxicam compared to those of tenoxicam in patients undergoing laparoscopic cholecystectomy.

Population, Setting and Sample

The study consists of 60 ASA physical status of I and II, between the ages of 18 to 65 years, scheduled for elective laparoscopic cholecystectomy. Exclusion criteria were as follows: hypersensitivity to NSAIDs, history of peptic ulceration, gastrointestinal bleeding or any bleeding disorder, presence of renal disease, hepatic disorder, cardiac or blood disease, morbid obesity, any possibility of pregnancy, history of bronchial asthma, chronic pain disorder, any history of psychiatric illness, and use of NSAIDs, opioids, diuretics, angiotension-converting enzyme inhibitors, warfarin, digoxin, methotrexate, cimetidine, glibenclamide, or lithium in the 24 hours preceding surgery (Bayindir et al., 2006).

Patients were randomized into 2 groups in a double-blind fashion. Randomization was done using a sealed envelope method. Patients were not pre-medicated. Group T (n=30) received 40mg tenoxicam and group L (n=30) received 16mg lornoxicam intravenously prior to the induction of anesthesia. All patients

in both groups were under the same anesthesia parameters during the laparoscopic cholecystectomy. The surgery was performed using the same techniques in all patients.

In the recovery room, all of the patients were set-up with a Patient Controlled Analgesia (PCA) device and all patients were set to deliver Morphine Sulfate (MS) 50ug/kg as a loading dose and 20ug/kg as a bolus dose with a lockout of 10 minutes without any background infusion. A loading dose was administered according to the patients' demands and the time from extubation and administered loading dose was recorded as a first MS demand time. Pain intensity was assessed with a Visual Analog Scale (VAS) from 0 to 10. At the end of 2 hours, patients were discharged from the recovery room to the ward. Postoperative pain scores, localization of pain and cumulative MS consumption were assessed at 15 and 30 minutes and 1, 2, 4, 6, 12, and 24 hours following the extubation and data were recorded. An investigator, blinded to the patients of each two groups, recorded the pain scores and analgesia requirements (Bayindir et al., 2006).

### Instruments

Statistical analysis was performed using SPSS 11.0 Windows. For the comparison between groups, t-test for parametric data and X2 test for non-parametric data were used. A value of  $p < 0.05$

was considered statistically significant for all analysis. Sample size was calculated by power analysis. Fifty-seven patients completed the study; one patient from group L and two patients from group T were withdrawn from the study because the surgery proceeded to laparotomy (Bayindir et al., 2006).

### Findings

Although pain levels were not significantly different, there was an important difference in the first MS demand times between groups ( $p=0.037$ ). The first MS demand time was  $18.79 \pm 3.02$  minutes in group L, whereas it was  $11.89 \pm 0.98$  minutes in group T. The mean VAS were higher in group T at 15 minutes ( $p=0.036$ ), 1hr ( $p=0.020$ ), 2hr ( $p=0.001$ ) and 4 hours ( $p=0.0042$ ) after extubation ( $p<0.05$ ). Although the cumulative MS consumptions were higher in Group T, no statistically significant difference was found between the groups. Cumulative MS consumption was  $23.04 \pm 2.81$  and  $22.66 \pm 2.03$ mg in groups L and T, respectively, at the end of 24 hours. The comparison of the calculated cumulative MS consumptions on a per kilogram basis showed a statistically significant difference between the two groups at 15 ( $p=0.037$ ) and 30 minutes ( $p=0.016$ ), 1 ( $p=0.004$ ) and 2 hours ( $p=0.013$ ) (Bayindir et al., 2006).

### Conclusions

In the postoperative period, there was no difference in the severity of nausea in both groups, but nausea occurred between 15 minutes and the first hour in Group L, whereas it occurred between 30 minutes and 2 hours in Group T. There was no significant difference in patient satisfaction between the groups while discharging from the hospital.

These findings suggested that lornoxicam was more potent than tenoxicam, and its analgesic effect lasted longer. Pain scores were lower in Group L throughout the study, but this difference was statistically only at 15 minutes, 1, 2 and 4 hours.

The study has concluded that the pre-emptive use of lornoxicam, in 16mg doses, was found to be superior to the 40mg of tenoxicam in increasing time to first MS demand and reducing postoperative MS consumption and causing less adverse effects. Since lornoxicam was not found to be superior to tenoxicam after 4 hours in this study, further studies comparing repeated doses of both these drugs in the 4 and 6 hours following laparoscopic cholecystectomy are needed.

### Problem

One of the benefits of laparoscopic surgery is reduced postoperative incisional pain. However, nausea, vomiting, and

pain from visceral manipulation during laparoscopic cholecystectomy (LC) may be severe and prevent early discharge from same day surgery.

### Purpose

The purpose of this study was to determine whether bupivacaine used intraoperatively during LC improves postoperative pain originating from the abdominal viscera. There was no framework used for the study (Ates et al., 2006).

### Population, Setting and Sample

The sample consisted of 50 adults scheduled for elective LC, randomly placed into two groups by envelopes. Inclusion criteria were as follows: American Society of Anesthesiologist (ASA) class of I or II uncomplicated patients, no history of diabetes, no prior abdominal surgery, no allergy to bupivacaine and no prior exposure to chronic corticosteroid, Non-steroidal anti-inflammatory drugs or immunosuppressive drugs. Exclusion criteria were as follows: gall bladder perforation and bile contamination of the peritoneum, surgical manipulation that necessitated the elongation of the incision at one of the trocar sites (e.g. stone extraction, open laparoscopy and hemostasis of the port sites), repeated trocar entry attempts more than twice, overt intra-abdominal adhesions with need for extensive surgical

dissection or conversion to open surgery or any surgical complication requiring further medical or surgical invention.

The two groups were induced with identical general anesthesia. The surgeries were performed by two senior surgeons who performed the surgeries in identical format and procedural sequence. The only exceptions to the surgeries were with group 1, before the removal of the trocars and desufflation, 30ml of bupivacaine 0.25% was administered and group 2 had 30ml of saline solution was administered to the upper surface of the liver, right subdiaphragmatic space, gall bladder bed, and the hepatoduodenal ligament.

### Instruments

Fifty envelopes were prepared at the beginning of the study, 25 placebo (saline) and 25 bupivacaine. An independent investigator prepared the drug and placebo in regard to the randomly selected envelopes and data collected from inside the same envelope.

The same blinded investigator performed postoperative follow-up of patients at 30 minutes, 1, 2, 4, 6, 8, 12 and 24 hours. No routine analgesic was given postoperatively. Postoperative pain management was conducted according to the analgesic demand of the patient. Visual Analog Scale (VAS) and

numeric Pain Scale (NPS) scores and total analgesic consumption were recorded at the follow-up intervals (Ates et al., 2006).

Statistical analysis was performed by student's t-test and X<sup>2</sup>-test,  $p < 0.05$  was considered as significant difference. Demographic data, duration of the operation and recovery profile concerning age, body surface area, male/female ratio, surgical and anesthesia duration time were similar in both groups ( $p > 0.05$ ).

### Findings

There was no statistically significant difference between the groups in terms of response to painful stimulus and the completion of anesthesia ( $p > 0.05$ ). None of the operations necessitated conversion to open surgery and none of the patients were excluded from the study. The distribution of mean total analgesic administered in the two groups was not significantly different ( $p > 0.05$ ). In group 1 (bupivacaine), the distribution was 120mg metamizol in 3 patients and 16mg meperidine in 7 patients. In group 2 (saline), the distribution was 280mg metamizol in 2 patients and 16mg meperidine in 9 patients. In group 1, 2 patients complained of nausea and vomiting and in group 2, 1 patient complained of nausea and vomiting (Ates et al., 2006).



There was no differences between the groups in terms of analgesic administration and incidence of nausea and vomiting ( $p>0.05$ ). No side effect due to administration of bupivacaine was recorded. The mean VAS and NPS scores were similar postoperatively between the two groups for each postoperative time period checked by the investigator. The VAS scores at 30 minutes postoperative were 6.5, at 4 hours postoperative were at a 2.5 and at 48 hours were less than a 1 for both groups (Ates et al., 2006).

### Conclusions

The success of local anesthetic infiltration with long duration of action at the trocar sites where the analgesic effect of bupivacaine continues several hours after the completion of the surgical procedure led to the decision to use intraperitoneal bupivacaine to improve postoperative pain originating from the abdominal viscera. However, the extent of intraperitoneal dissection and the magnitude of pain originating from the abdominal viscera are similar in open and laparoscopic procedures. Therefore, if the use of local anesthetics at skin and abdominal wall was found to be effective, perhaps intra-abdominal use of local anesthetics could be effective as well. This study did not produce an additional benefit with regard to postoperative pain relief with the injection of 30ml bupivacaine

0.25% squirted on the upper surface of the liver, right subdiaphragmatic space, gall bladder bed, and the hepatoduodenal ligament.

### Problem

The majority of cholecystectomies are performed laparoscopically. However, the effects of different postoperative analgesics have not been thoroughly investigated in patients recovering from laparoscopic cholecystectomy.

### Purpose

The purpose of this study is the possibility of preoperative Non-steroidal anti-inflammatory drugs (NSAIDs) reducing postoperative pain and nausea after laparoscopic cholecystectomy.

### Population, setting and Sample

The prospective, placebo-controlled and double-blind study consisted of 60 patients. Sixty patients were calculated to be the sample size required to give an 80% probability of detecting a difference between treatment groups with a type I error of 0.05. The inclusion criteria were any ASA score of I or II and scheduled for elective laparoscopic cholecystectomy. The exclusion criteria were any allergy to a study drug, a history of prolonged bleeding or peptic ulcer disease, known cardiac, lung, or renal disease, abnormal liver function test results and

the use of either an opiate or NSAID within 2 weeks of the surgery. Patients were withdrawn from the study if an open cholecystectomy became necessary.

A standard anesthetic was administered to all patients. After induction of anesthesia, the patients were then randomly allocated to one of the three treatment groups; a placebo group, A Ketorolac group and an Indomethacin group. This was done by the operating room nurse, who removed the study drugs from a sealed and numbered envelope. All patients received both a deltoid intramuscular (IM) injection and a rectal suppository (RS). Group K received 30mg of Ketorolac IM and a glycerin suppository (RS); Group I received an injection of normal saline and a 100mg Indomethacin suppository; Group P received an injection of normal saline and a glycerin suppository (Butler, 1996). The patient, surgeon and researcher were all blinded to the patient's treatment group. The surgery was a standard four-trocar laparoscopic cholecystectomy. The patients were transferred to the recovery room, where they immediately received 10mg of metoclopramide intravenously. Data were collected at 15, 30, 60, and 120 minutes after arrival in the recovery room by the researcher. The patients scored their pain using a Visual Analog Scale (VAS) from 0 to 10. Patients complaining of pain were given 25ug boluses of Fentanyl citrate

every 5 minutes until they were comfortable. Patients were treated with 25mg of diphenhydramine hydrochloride, if needed for nausea or vomiting.

### Instruments

The data were analyzed by a non-parametric analysis of variance for multiple comparisons and the Mann-Whitney test for inter-group comparison; a  $p < 0.05$  was considered significant. Data are presented as the means (and standard deviation) (Butler et al., 1996).

### Findings

Data were analyzed from 52 patients. There were no statistically significant differences in the patient parameters among the three groups. Similar results were found for the operative data. There were no reported cases of hemorrhage or operative complications in any group.

The placebo group scored a mean VAS of 7.2cm at 15 minutes postoperatively whereas the Ketorolac and Indomethacin groups scored 3.6cm and 3.7cm respectively. The difference between the placebo group and the other two groups was significant ( $p < 0.05$ ). The scores on the VAS for the remainder of the patients' postoperative recovery revealed no significant differences between any of the three groups. The total postoperative Fentanyl Citrate dose reflects treatment based on the patients'

request for opiates when offered. The placebo group was administered a mean of 2.0ug/kg whereas the ketorolac group received only 0.46ug/kg and the Indomethacin group only 0.56ug/kg ( $p < 0.05$ ). There were no reported significant differences between group K and group I for VAS and mean postoperative Fentanyl Citrate doses after the first 15 minute measurement. This suggests that the initial difference in the degree of pain experienced by patients in the three groups was overcome by the nurse's successful treatment, in the placebo group, in administering more Fentanyl citrate between the first and second VAS measurement.

When compared with the placebo group, the preoperative use of Ketorolac and Indomethacin decreased early postoperative pain after laparoscopic cholecystectomy. Patients in both treatment groups requested less opiate analgesia than those in the placebo group because they experienced less pain within the first 15 minutes in the recovery room. The patients who received NSAIDs preoperatively also reported less nausea or emesis than patients in the placebo group, who had more pain and received approximately four times as much Fentanyl Citrate postoperatively. The increased frequency of nausea or emesis in the placebo group is likely a reflection of the administration

of more opiates, with their adverse effect on gastrointestinal function.

### Conclusions

The study data suggest that Ketorolac given IM and Indomethacin given RS are equally efficacious in reducing early pain after laparoscopic cholecystectomy. Ketorolac IM reaches peak serum levels after an average of 50 minutes, and rectal Indomethacin required approximately the same amount of time. The results reveal no appreciable difference in clinical effect between ketorolac and Indomethacin. Therefore, the increased cost of Ketorolac does not appear warranted (Butler et al., 1996).

### Problem

Dobrogowski et al. (2004) stated that recent research has revealed that opioids can act directly on the peripheral terminal of afferent nerves to mediate antinociception. Postoperative incisional pain may be reduced through the use of local anesthetic infiltration, topical application, or perfusion of anesthetic into the surgical wound.

### Purpose

The aim of this study was to assess the influence of peripheral Morphine and local anesthetic infiltration at trocar insertion points on the nociception process in the postoperative

period in laparoscopic cholecystectomy patients (Dobrogowski et al., 2004).

Population, Setting and Sample

This study involved 150 patients with American Society of Anesthesiologists classifications I and II, who underwent scheduled laparoscopic cholecystectomy. Exclusion criteria were as follows: younger than 18 years of age, acute cholecystitis, history of cardiac, respiratory, hepatic, renal, or neurologic disease. Patients with confirmed local anesthetic and morphine allergies and patients taking analgesics for nonbiliary complaints were also excluded.

Using sealed envelopes that had been prepared according to a computer-generated random-number table, the patients were assigned to one of the following 5 groups:

- (1) Group M (morphine, n=30), in this group, 10 minutes before the start of the surgical procedure, trocar insertion points were infiltrated with 2mg of morphine in 20ml of 0.9% NaCl solution (5ml of solution per each trocar insertion point).
- (2) Group B (bupivacaine, n=30), in this group, 20ml of 0.25% bupivacaine solution was used for infiltration.

- (3) Group M + B (morphine + bupivacaine, n=30), in this group, trocar insertion points were infiltrated with 2mg of morphine in 20ml of 0.25% bupivacaine solution.
- (4) Group S (saline, n=30), in this group 20ml of 0.9% NaCl solution was used for infiltration.
- (5) Group S + M (saline + subcutaneous morphine, n=30), in this group, 20ml of 0.9% NaCl solution was used for infiltration and 10 minutes before the start of the surgical procedure, patients were given 2mg of subcutaneous morphine.

The laparoscopic cholecystectomies were performed by two surgeons who used the same 4-port technique for all surgeries. All of the patients received the same general anesthesia. All of the groups were premeditated with 7.5mg of oral midazolam 1 hour before the start of surgery (Dobrogowski et al., 2004).

Following the surgery and transfer to the recovery room, pain medication was administered by nursing personnel only when requested by the patient. The nurses did not know how the patients were assigned to research groups. The on-request tramadol dose 100mg and was administered as an intravenous injection. Tramadol was chosen as the synthetic opioid because it causes less smooth muscle spasm and less of an increase in



intrabiliary pressure than morphine. Prophylactic antiemetics were not used.

### Instruments

After surgery, the following were measured: postoperative pain intensity scored by Visual Analog Scale (VAS), tramadol requirement in individual research groups, the time from the completion of the procedure to the administration of the first dose of tramadol, and the occurrence of undesirable side effects (drowsiness, nausea, and vomiting).

The VAS scores were assessed at 4, 8, and 12 hours after completion of the surgery. The on-demand analgesia data were calculated for the first 48 hours after surgery. Research results were subjected to statistical analysis. Demographic data, pain intensity, the time from the completion of the surgery to the administration of the first dose of tramadol, and the tramadol requirement in the postoperative period were presented as mean  $\pm$  Standard deviation (SD). Because more than 2 research groups were involved, analysis of variance was conducted to determine statistically significant differences among groups. Demographic data was examined by use of the X<sup>2</sup> test for gender and ASA class, as well as analysis of variance for other parameters. Statistical significance was ascribed to observations with a p value of .05 or less. All statistical

calculations were made by application of the Statistica version 6.0 PL software (StatSoft, Tulsa, OK) (Dobrogoswki et al., 2004).

### Findings

The results showed no statistically significant differences were observed among the different groups of patients as far as their age, gender, body weight, ASA class, or the duration of the surgical procedure. Pain intensity scored on the VAS was lower in groups M, B, and M + B compared with groups S and S + M, but these differences were not statistically significant. After awaking, patients described moderate pain scores, and from 4 hours onward, pain scores gradually decreased. No differences in total tramadol requirement in the postoperative period occurred between the groups. Large individual variations in total tramadol consumption occurred, but there were no statistically significant differences between the groups. The time elapsed from the completion of the surgery to the administration of the first dose of tramadol was longer in groups M, B, and M + B compared with groups S and S + M. These differences were statistically significant. Frequency of undesirable side effects (sedation, nausea, and vomiting) was similar in all research groups (Dobrogoswki et al., 2004).

### Conclusions

The results of this study indicates that local infiltration at trocar insertion points with 2mg of morphine and/or 50mg of bupivacaine is not effective in reducing postoperative pain after laparoscopic cholecystectomy. Pain intensity and total tramadol requirement after surgery were lower in groups M, B, and M + B compared with groups S and S + M, but these differences were not statistically significant or clinically relevant. However, the results suggest that morphine and bupivacaine reduced pain at the site where they were administered, but other factors, in addition to the abdominal wall incisions, must be responsible for the production of pain after laparoscopic cholecystectomy. Preincisional opioid and local anesthetic infiltration at trocar insertion points had some effect in our patients, but the effect failed to reach statistical significance and is, therefore, of doubtful clinical relevance.

### Problem

Administration of bupivacaine to the subhepatic area has been reported to be beneficial for postoperative analgesia. One of the main causes of the pain after laparoscopic cholecystectomy is the peritoneal and visceral irritation caused by the pneumoperitoneum. Injection of the local anesthetic

before the pneumoperitoneum may provide preemptive analgesia by preventing the establishment of central sensitization following noxious stimulus.

### Purpose

The researcher aims to investigate the effect of blind intraperitoneal injection of bupivacaine to the subhepatic area before the creation of the pneumoperitoneum, as compared to both the administration immediately after the creation of the pneumoperitoneum, and administration just before the removal of the trocars (Akbulut et al., 2006). The study did not have a framework.

### Population, setting and Sample

The study consisted of 80 patients, with an American Society of Anesthesiologists (ASA) status of I or II, undergoing elective laparoscopic cholecystectomy. Exclusion criteria included acute cholecystitis and history of allergy to local anesthetics. The patients were randomly placed into four groups. Patients were blinded as to the analgesic regimen that they received intraoperatively. All surgeries were performed by the same surgeon and induced with the same anesthesia. In group 1, just after the intubation, before the creation of the pneumoperitoneum, using a 20 gauge needle, 20ml of 0.5% bupivacaine was injected 2cm below the right subcostal margin to

the subhepatic area, following the sensation of peritoneal puncture. Patients in group 2 and 3 received the same dose of the drug to the subhepatic area via the midclavicular subcostal trocar, immediately after the creation of the pneumoperitoneum or just before the removal of the trocars. Patients in group 4 received no local anesthetic drugs. After the injection of bupivacaine (groups 1 and 2), patients were placed in the Trendelenburg position for 10 minutes. Within the last 30 minutes of the surgery, the patients did not receive fentanyl. The patients receiving fentanyl in this period or naloxone for opioid antagonism were excluded from the study (Akbulut et al., 2006).

### Instruments

Postoperative pain was assessed using a Numeric Rating Scale (NRS) when the patient was able to co-operate in the recovery room upon entering the recovery room and at 4, 8, 12, and 24 hours after the surgery. The patients suffering from pain associated with a NRS greater than 4 received diclofenac sodium 75mg intramuscularly, repeated if required. All assessments were performed by a single observer who was blinded to group allocations. If patients were not satisfied with the level of the analgesia offered by diclofenac sodium, they were given pethidine were terminated from the study (Akbulut et al., 2006)

Demographic variables (age and body weight), as well as duration of the surgery, NRS scores, and analgesic consumption were analyzed by the Kruskal-Wallis test, followed by the Mann-Whitney U-test. Differences in nominal data, such as sex, and the need of pethidine, were analyzed by the chi-squared test. A p value of  $<0.05$  was considered to be significant. In order to detect a difference of 1.5 on NRS (0-10) pain scores, 16 patients were estimated to give sufficient power (80%) for a significance level where  $\alpha=0.05$ . To account for subject loss due to exclusion criteria during the study, 20 patients were in each group (Akbulut et al., 2006).

### Findings

The demographic data (sex, age, weight) and duration of the surgery were similar in all the groups. Two patients in each of groups 1 and 2 and three patients in each of group 3 and 4 required fentanyl supplementation within the last 30 minutes of the operation and were excluded from the study. Two patients in group 1, one patient in group 3, and two patients in group 4 received pethidine postoperatively and were terminated from the study. No patient in group 2 received pethidine. The number of patients who required pethidine did not differ significantly among the groups. NRS pain scores did not differ among groups 1, 3, and 4. NRS pain scores of group 2 were lower than the other

groups at each measurement time point ( $p < 0.001$ ). Postoperative analgesic consumption did not differ among groups 1, 3, and 4. The analgesic consumption of group 2 was lower than the other groups ( $p = 0.005$  group 1 vs. group 2,  $p = 0.026$  group 3 vs. group 2, and  $p = 0.022$  group 4 vs. group 2) (Akbulut et al., 2006).

### Conclusions

The traditional approach to postoperative analgesia is to start therapy when surgery is completed and pain is experienced. Mounting evidence from basic research into the mechanisms of pain suggests that the administration of analgesic drugs may be more effective if given before, rather than after nociceptive stimuli. The postoperative pain induced by laparoscopic surgery has a considerable visceral component (owing to surgical handling and diaphragmatic irritation caused by intraperitoneal distension) and a smaller component that is somatic in origin (owing to the incisions made in the abdominal wall for the trocars). The use of wound infiltration with local anesthetics for postoperative pain relief may be an attractive method because of its simplicity, safety, and low cost. The study concluded with the suggestion that the infiltration of 20ml of 0.5% bupivacaine to the subhepatic area offers good postoperative analgesia when applied just after the creation of

the pneumoperitoneum, not before the pneumoperitoneum or after the termination of the pneumoperitoneum (Akbulut et al., 2006).

### Problem

Laparoscopic cholecystectomy and laparoscopic inguinal hernia repair are two of the most common laparoscopic surgeries performed in same day surgery centers. The escalating costs of health care have highlighted the importance of minimizing drug expenditure. Many centers use Non-steroidal anti-inflammatory drugs (NSAIDs), such as Ketorolac and diclofenac to achieve analgesia without the cost and side effects of opiate analgesia.

### Purpose

The study reviewed is a prospective randomized trial to compare the efficacy of preemptive intravenous ketorolac and rectal diclofenac use for ambulatory inguinal hernia repairs under general anesthesia (Goh et al., 2002). There was no framework used for this study.

### Population, Setting and Sample

The study consisted of 108 patients who underwent ambulatory hernia repair under general anesthesia. All surgeries were performed by the same surgeon and surgical team and were induced with the same anesthesia protocol. The patients were randomized into two groups by drawing designated preoperative order forms from a sealed envelope. Group I patients (n=54) received



intravenous (IV) ketorolac 30mg upon induction of general anesthesia and group II patients (n=54) had rectal diclofenac 50mg after informed consent was obtained just prior to surgery prep at the same day surgery center. Prospective collection and analysis of data were performed. During the recovery phase, a registered nurse blinded to the trial performed the pain score assessment at 2 and 6 hours postoperatively. Severity of pain was assessed using a Linear Analog pain scale (LAS). All patients were prescribed with oral analgesic, propoxyphene 50mg and paracetamol 325mg, 4 times daily and diclofenac sodium SR 100mg daily on patient demand. Patients were scheduled for follow-up in 1-2 weeks. Telephone interviews, by a nurse, were carried out on 1 and 3 days postoperatively. Problems encountered by the patient on their way home and during sleep on the day of surgery were documented. Total amount of analgesic consumption and pain scores at 24 and 72 hours were recorded.

### Instruments

The Student's t-test and chi-squared test, as appropriate, were used to detect differences between the two groups of patients. P value of  $<0.05$  were used for significant differences. Statistical analysis was performed with the help of computer software (SPSS/PC + 9.0, Chicago, Illinois, USA). Values were expressed as mean  $\pm$  standard deviation (SD).

### Findings

There were 94 men and 14 women, ages from 12-70 years with a mean age of 51 years. Comparison of the demographics features showed no significant differences. The anesthetic time and total dosage of anesthetic medications of the two groups were comparable. Postoperative pain scores at 2 and 6 hours after the surgery were comparable between the two groups. The average number of analgesic tablets taken by patients at 72 hours were  $2.5 \pm 1.2$  and  $2.6 \pm 1.8$  in groups I and II ( $p=NS$ ). The postoperative pain scores of day one and three showed no significant difference ( $p=NS$ ) (Goh et al., 2002).

### Conclusions

NSAIDs form an important component of multimodal analgesia, which appears to be the best contemporary method for pain control after ambulatory surgery. The results of the study suggest diclofenac suppository 50 mg was capable of providing comparable analgesia to intravenous ketorolac 30mg and had an economic benefit over IV ketorolac. In the interests of cost containment rectal diclofenac could be considered the NSAID of choice for pre-emptive analgesia (Goh et al., 2002).

### Problem

Laparoscopic cholecystectomy is a common procedure. However, these patients experience significant postoperative pain,

frequently in the abdomen or shoulder region, which is often maximal on the first postoperative day. Pain after laparoscopic cholecystectomy has three major components: parietal, visceral and shoulder pain. Different local anesthetic infiltration techniques have been tried for the relief of post-laparoscopic cholecystectomy pain. Tramadol has been found to be an effective analgesic when given both intra-articularly or when added to local anesthetics for nerve blocks.

#### Purpose

The aim of this study was to compare the postoperative analgesic efficacy of intraperitoneal (IP) with intravenous (IV) tramadol in patients undergoing laparoscopic cholecystectomy (Abbasoglu et al., 2008).

#### Population, Setting and Sample

The study consisted of 69 patients with ASA of I or II physical status and scheduled for laparoscopic cholecystectomy. Exclusion criteria were as follows: acute cholecystectomy, history of analgesic or narcotic use, previous abdominal surgery, hypersensitivity to study drugs, or needed conversion to open cholecystectomy or postoperative drains (Abbasoglu et al., 2008).

The patients received the same standard anesthesia per protocol. All patients were premedicated with 5mg diazepam

orally. At the end of the surgery, metoclopramide 0.5mg/kg was administered to all patients to minimize postoperative nausea and vomiting. Patients were randomized to one of three groups in a double-blind manner using a computerized allocation schedule and coded syringes. After randomization, an anesthesiologist not involved in patient care and data collection prepared the coded syringes. All patients received two sets of coded syringes filled with the study drugs at two different times: first, immediately after installation of the pneumoperitoneum but before dissection of the gall bladder, and second, after control of haemostasis but before removal of the trocars. The anesthesiologist injected the drugs IV, the surgeon injected the drug IP. In all groups, 10ml of the study drug was injected into the hepatodiaphragmatic space, 5ml into the area of the gallbladder and 5ml was injected into the space between the liver and the kidney under direct vision by the surgeon. At the end of surgery, the surgeon injected an additional 20ml of the study solution into the same areas.

In the control group, all injections were with normal saline. In the IV group, patients received IV tramadol 100mg and intraperitoneal saline. In the IP group, patients received IV saline and IP tramadol 100mg.

In the recovery room, all patients with a Numeric Rating Scale (NRS) for postoperative pain  $> 4$  were started with patient-controlled analgesia (PCA) of morphine with a bolus of 1mg and a lock-out interval of 7 minutes and a 4 hour limit of 20mg with no background infusion. A blinded observer recorded pain, delay until first morphine dose, cumulative morphine consumption and adverse effects (nausea, vomiting, shivering, sedation and muscular rigidity) at 0, 15, 30, 60 minutes and 24 hours postoperatively. The patients were discharged from the recovery room according to Aldrete criteria (Abbasoglu et al., 2008).

### Instruments

Patient characteristics, duration of the procedure and recovery room stay, delay until first analgesic, pain scores and postoperative morphine consumption were analyzed using analysis of variance, Kruskal-Wallis test and X<sup>2</sup> test. Generalized linear model for repeated measures was used to analyze pain scores to test for differences between and within groups. Significance was determined at  $p < 0.05$  level. A Bonferroni adjustment was made for multiple comparisons. Results are given as medians for non-parametric data and as mean standard deviation (SD) for continuous data. A power of 0.80 was assumed to detect a 2-point

difference in NRS scores (mean pain score of 6 and assuming an SD of  $\pm 2.5$  in all groups) between the tramadol groups and the control group (Abbasoglu et al., 2008).

### Findings

Of the 69 patients, 8 were excluded because of the use of an intra-abdominal drain in one, incomplete administration of drugs in three, and conversion to open cholecystectomy in four. Patient characteristics, duration of surgery and duration of stay in the recovery room were similar between groups. Parietal pain at rest, during cough and during movement were lowest in the IV tramadol group during the first postoperative hour ( $p < 0.016$  compared with control). Although IP tramadol decreased partial pain scores, this effect did not reach statistical significance when compared with saline. There were no differences between the three groups at and after the first postoperative hour. The analgesic effects of tramadol were more prominent on visceral pain scores. The lowest visceral pain scores were recorded with IV tramadol ( $p < 0.016$  compared with control during the first postoperative hour). The difference between IP tramadol and control was significant only at the 15 minute ( $p < 0.016$ ). There were no differences between the three groups regarding visceral pain scores after the first postoperative hour. The delay until the first analgesic

administration was similar in the IV tramadol group (median 23 min, range 1-45) compared with the IP tramadol group (median 10 min, range 1-120),  $p=0.263$ , but was shorter compared with the control group (median 1 min, range 1-30)  $p=0.015$ . When the IP tramadol group was compared with the control group, the difference was not significant ( $p=0.027$ ) (Abbasoglu et al., 2008).

The cumulative 1 hour dose of morphine was significantly lower in the IV tramadol group (mean  $\pm$  SD;  $3.4 \pm 2.5$ mg) and in the IP tramadol group ( $4.4 \pm 4.3$ mg) compared with the control group ( $6 \pm 2$ mg) ( $p=0.044$ ). Morphine consumption during 24 hours was similar in all three groups (control  $24 \pm 18$ mg, IV tramadol group  $16 \pm 15$ mg, IP tramadol group  $16 \pm 15$ mg). There were no differences in the incidence of shoulder pain, nausea, vomiting, sedation, itching, and shivering (Abbasoglu et al., 2008).

### Conclusions

The study results have shown administration of IV tramadol to have slightly lower pain scores, shorter time interval to the first analgesic administration and less morphine consumption compared with normal saline during the first postoperative hour after laparoscopic cholecystectomy and IP tramadol was not as effective as the equivalent dose of tramadol IV. IV tramadol may

be incorporated into a multimodality pain therapy after laparoscopic cholecystectomy.



## Summary

Ambulatory surgical procedures have expanded in recent years as a result of increases in the cost of inpatient health services and pharmacological medications. Evidence of the increasing recognition of the advantages of outpatient surgical settings have been reflected in the shift from inpatient to outpatient reimbursement for a growing number of surgical procedures. Any measures which improve the outcome of surgery, especially when related to postoperative pain control, can aid in the cost containment of health care.

Evidence-based Practice Table

Source	Problem	Purpose	Framework	Sample	Design	Instruments	Results
T a y l o r ( 2002)	Ambulatory surgery patients not ready for discharge from PACU related to postoperative pain	Determine whether the type & amount of narcotic administered in the PACU is associated with the length of stay in the ambulatory surgery unit	Dorothea Orem's Self- Care Theory of Nursing	190 patients undergoing a dilatation and curettage	Retrospective descriptive Chart Review	Data collection form ANOVA T-test	ANOVA-determine no relationship between groups that did or did not receive narcotic analgesics and the type of narcotic analgesics in PACU, discharge area, length of stay in PACU &

							<p>discharge area.</p> <p>T-test=No</p> <p>correlation</p> <p>between any group</p> <p>means of length</p> <p>of stay in</p> <p>ambulatory</p> <p>surgery unit or</p> <p>type/amount of</p> <p>narcotic</p> <p>administered in</p> <p>PACU.</p>
<p>Lenihan</p> <p>(2001)</p>	<p>Narcotic</p> <p>analgesic</p> <p>causes</p> <p>sedation,</p>	<p>Determine if</p> <p>amount of</p> <p>narcotics</p> <p>required</p>	<p>Hans Selye's</p> <p>(1978)</p> <p>General</p> <p>Adaptation</p>	<p>51 subjects</p> <p>from an HMO who</p> <p>undergone a</p> <p>laparoscopic</p>	<p>Quasi-</p> <p>experimental</p>	<p>Data</p> <p>collection</p> <p>form</p> <p>T-test</p>	<p>t-test=patients</p> <p>receiving</p> <p>Ketorolac</p> <p>intraoperatively</p>

	respiratory depression, nausea, and vomiting.	postoperatively was a significantly less when ketorolac was administered intraoperatively than when no Ketorolac was administered for laparoscopic cholecystectomy.	Syndrome	cholecystectomy		Chi-square test Nonparametric Mann-Whitney U test	required less Morphine sulfate postoperatively than those not receiving intraoperative Ketorolac. Chi-square=no statistical significant difference between the groups who where administered preoperative medication.
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							Non-parametric Mann-Whitney U test=No statistical significant difference between groups confounding variables
Costa (2001)	Limited time with admission and discharge nurses often leaves patient & family feeling stress	Explore ambulatory surgery patient's perceptions of the perioperative	Hermeneutic phenomenology provides an understanding of the essence of the	13 women, 3 men from ambulatory surgery unit from a large teaching hospital who have undergone	Hermeneutic phenomenological reflection	Semi- Structured interview Analysis of thematic aspects of lived	3 common themes: 1. Fear-most common, fear of death. 2. Knowing-"not" knowing indicates inadequate

	& anxiety regarding surgical experience	experience and address the essence of the perioperative as perceived by patients who have undergone ambulatory surgery.	perioperative experience perceived by patients.	same day surgery.		experiences by patients interview	pre/post operative teaching 3. Presence- presence of nurses & family throughout perioperative experience.
Roberge (1997)	Ambulatory surgery stay short, need for effective postoperative pain management	Determine if intraoperative local anesthesia, specifically bupivacaine, improved control	The Gate- Control Theory of Pain, presented by Melzack & Wall (1965)	120 male adults undergoing inguinal herniorrhaphy in same day surgery unit	Retrospective non-experimental study conducted in an ex post facto design	Data collection form T-test ANOVA	Group given intraoperative bupivacaine required less narcotic & required less time in PACU than

		of postoperative pain & to explore the relationship between general anesthesia without local anesthesia & postoperative pain					group receiving no intraoperative bupivacaine
Badano (2004)	Finding better control of postoperative pain control in ambulatory surgery	Evaluate the efficacy of Ketamine as a preemptive perioperative analgesic in low	Ketamine binds to the N-Methly-D- asparate (NMDA) receptors as	40 patients from surgical unit in Tokyo hospital undergoing laparoscopic	Randomized double-blind	Data collection form ANOVA X2 test	Ketamine at low doses, given intravenously during gallbladder removal reported

	patients	dosages	a non-selective antagonist, thereby, reducing hyperalgesia	cholecystectomy			to be a good analgesia at the awakening, with less reports of postoperative analgesia required
Bayindri (2007)	Opioid compounds side effects may delay hospital discharge for same day surgery	Compare the efficacy, tolerability & morphine sulfate sparing effects of lornoxicam compared to tenoxicam in patients	None noted	57 patients undergoing laparoscopic cholecystectomy	Prospective double-blind	t-test X2 test	Pre-emptive use of lornoxicam was superior to tenoxicam in increasing time to first morphine demand & reducing postoperative morphine



		undergoing laparoscopic cholecystectomy					consumption & causing less adverse effects
Ates (2006)	Postoperative pain may prevent early discharge from same day surgery	Determine whether bupivacaine used intraoperatively during laparoscopic cholecystectomy improves postoperative pain originating from the abdominal viscera	None noted	50 adults undergoing laparoscopic cholecystectomy at same day surgery center	Prospective double-blind	T-test X2 test	There was no significant differences between the control group & the bupivacaine group, in terms of analgesic consumption

Butler (1996)	Reducing postoperative pain & nausea after laparoscopic cholecystectomy in same day surgery	Preoperative Non-steroidal anti- inflammatory drugs (NSAIDs) for possible reduction in postoperative pain & nausea following laparoscopic cholecystectomy	None noted	60 patients undergoing laparoscopic cholecystectomy in ambulatory surgery unit	Prospective, randomized double-blind	ANOVA Mann-Whitney U test	Data demonstrates that NSAIDs ketorolac & Indomethacin, administered preoperatively, decrease early postoperative pain & nausea after laparoscopic cholecystectomy
Dobrogowski (2004)	Reducing postoperative pain in outpatient	Assess influence of peripheral morphine & local anesthetic	None noted	150 patients who underwent laparoscopic cholecystectomy	Retrospective randomized blind	ANOVA X2 test	Study indicates local infiltration at trocar insertion

	settings after laparoscopic cholecystectomy	infiltration at trocar insertion points on postoperative pain in laparoscopic cholecystectomy patients					points with 2mg of morphine and /or 50mg of bupivacaine is not effective in reducing postoperative pain after laparoscopic cholecystectomy
Aklulut (2006)	Postoperative pain control initiated after laparoscopic cholecystectomy not always	Investigate the effect of intraperitoneal bupivacaine administration to the	The proposed mechanism of preemptive effect of analgesia administered	80 patients undergoing elective laparoscopic cholecystectomy	Prospective randomized study	Kruskal- Wallis Mann-Whitney U test	Intraperitoneal injection of bupivacaine to the subhepatic area offers good postoperative

	effective	subhepatic area  before the  creation of the  pneumoperitoneum	before a  nociceptive  stimulus  reduces the  degree of  sensitization  produced in  the nervous  system by the  stimulus &  facilitates  subsequent  pain  treatment				analgesia when  applied just  after the  creation of the  pneumoperitoneum,  not before the  pneumoperitoneum  or after the  termination of  the  pneumoperitoneum
Goh (2002)	Minimize the  postoperative	Compare the  efficacy of pre-	None noted	108 patients  undergoing	Prospective  randomized trial	T-test  Chi-square	Diclofenac  suppository 50mg

	effects of opioids	emptive intravenous ketorolac and rectal diclofenac use for ambulatory inguinal hernia repairs under general anesthesia		inguinal hernia repair in same day surgery unit		test ANOVA	was capable of providing comparable analgesia to intravenous ketorolac 30mg and had an economic benefit over intravenous ketorolac
Abbasoglu (2008)	Pain after laparoscopic cholecystectomy has three major components: parietal,	Compare the postoperative analgesic efficacy of intraperitoneal with intravenous	None noted	69 patients undergoing laparoscopic cholecystectomy in same day surgery	Randomized double-blind	ANOVA Kruskal- Wallis test X2 test	Intravenous tramadol resulted in lower pain scores, shorter time from first administration

	visceral and shoulder pain	tramadol in patients undergoing laparoscopic cholecystectomy					than intraperitoneal tramadol
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## Chapter III

## Methodology

*Introduction*

In an ambulatory surgical unit it is important to have the patient ready for discharge to home before the next patient is released from the PACU area. Therefore, it is necessary to look at the PACU procedures to try and determine whether any causality exists between treatment methods in the PACU and the readiness of the patient to be discharged to home from the surgical unit. The purpose of the study is to determine whether the type and amount of narcotic administered in the PACU is associated with the length of stay and the postoperative pain level and intensity, reported by the patient, at the time of discharge to home, for the patients undergoing a laparoscopic cholecystectomy. This chapter includes: the problem, purpose, research design, population, sample, setting, data collection method and instruments, measures of data analysis, and protection of human rights.

*Research Questions*

1. Is the type of narcotic administered in the PACU associated with the length of stay in the ambulatory surgical unit for patients who have undergone a laparoscopic cholecystectomy?
2. Is the amount of narcotic administered in the PACU associated with the length of stay in the ambulatory surgical unit for patients who have undergone a laparoscopic cholecystectomy?
3. Is the type of narcotic administered in the PACU associated with the level and intensity of postoperative pain reported by the patient at the time of discharge to home for the patients who have undergone a laparoscopic cholecystectomy?
4. Is the amount of narcotic administered in the PACU associated with the level and intensity of postoperative pain reported by the patients at the time of discharge to home for the patients who have undergone a laparoscopic cholecystectomy?

*Setting*

The research will be carried out at an ambulatory surgical unit in a small northern Indiana hospital.



*Population and Sample*

The population for the study will consist of a systematic sample of patients. The selection criteria includes: 18 years of age or older, American Society of Anesthesiologist (ASA) class I or II, surgical procedure of laparoscopic cholecystectomy, body mass index (BMI) between 18 and 36, and documented teaching of Visual Analog Scale (VAS) and Verbal Rating Scale (VRS). Exclusion criteria of subjects, as determined by notation on the patients chart, will include: intraoperative complications such as changeover from laparoscopic to open cholecystectomy, postoperative complications such as shivering which was relived by medication, prolonged nausea and vomiting, or bleeding, history of psychiatric disorder, mental retardation, mental impairment, or mental disability and patients who are not discharged to home postoperatively. A systematic estimated sample of 190 patients will be selected by generating a computerized list of all patients who have undergone a laparoscopic cholecystectomy in the period from January 1, 2007 to January 1, 2008.

*Data Collection Method and Instrument*

The data will be collected from the medical records department, by the researcher and from a systematic random

sample of patient charts that have undergone a laparoscopic cholecystectomy. A data collection form has been developed as a tool for retrieving information from the patient charts. A pilot study will be performed using five randomly selected charts, within the study sample parameters, to determine whether the tool adequately meets the researcher requirements. The tool will also, be reviewed by the program coordinator and investigator for content validity and inter-rater reliability.

Data will be collected by reviewing the following sections of the patient chart: discharge summary, nursing admission form, physician orders, operating room record, anesthetic record, PACU record, ambulatory surgical record, ambulatory surgery summary, and any other medication forms.

The information collected will include: hospital number, age, weight, type of anesthetic agents used, ASA class, BMI, time entering OR, start/finish time of surgeon, time out of OR, time entering PACU, level of consciousness on entering PACU, notation of presence of pain in PACU, VAS and VRS scores, presence of complications in PACU, administration of medications (including time, name, route, dosage, and effect) in PACU, time of discharge from PACU, total time spent in PACU, time of admission to ambulatory surgical unit (ASU), notation of presence of pain in ASU, presence of complications

in ASU, administration of medications (including time, name, route, dosage, and effect) in ASU, time of discharge to home, total time spent in Ambulatory surgical unit, and if any delays were recorded in discharge from either PACU or ASU.

Narcotic type will be noted and equianalgesic dose will be calculated using the Equivalency Chart for Narcotic Analgesics (Stillman, 2000). Patients will be assigned to groups as follows: group I will be those patients who receive no medication in the PACU; Group II will be those patients who received the equivalent of one to five milligrams of morphine sulfate in the PACU; Group III will be those patients who received the equivalent of greater than five milligrams of morphine sulfate in the PACU and Group IV will be those patients who received analgesic tablets only.

Lengths of stay with and without administration of narcotic will be collected from both PACU and ASU. Postoperative length of stay is based on meeting identified discharge criteria, following standard protocol for ambulatory surgery based on regulations recommended by the International Anesthesia Research Society. Recovery from anesthesia is accompanied by return of vital signs to normal, normal level of consciousness, and the ability to walk without assistance.

Nausea, vomiting, and vertigo should be absent, and the patient should not have excessive pain (Chung, 1996).

### *Data Analysis*

All non-morphine narcotic analgesics, such as Demerol, will be converted using the Equivalency Chart for Narcotic Analgesics (Skillman, 2000). Descriptive data will be analyzed by using measures of central tendency and measures of variability. Analysis of variance (ANOVA) will be used to compare the difference among the groups length of stay, postoperative pain level and intensity, type and amount of narcotic administered in the PACU.

### *Protection of Human Rights*

The study will be reviewed by the Ball State University Committee for Protection of Human Subjects in Research and the Institutional Review Board (IRB) of the participating ambulatory surgical unit. The research will be presented and discussed with the program coordinators and appropriate departments for approval. There will be no risks to subjects since chart review will be utilized in the medical records department of the participating hospital. Confidentiality for the patient will be assured by using assigned code numbers only, and no names will be revealed in the study. The results

of the study will be reported in group statistical terms. No reference will be made to the study location or physicians. The completed forms will be kept in a locked, private office. In order to not duplicate the chart review, a separate list of medical record numbers coinciding with assigned code numbers will be used. It will be kept in a separate file and shredded once the data has been collected.

### *Summary*

This chapter has illustrated the procedure that will be used for collection and treatment of data used in this study. The study, using a retrospective chart review at a northern Indiana hospital ambulatory surgical unit, selected a specific group of patients who have undergone a laparoscopic cholecystectomy under general anesthetic. The chart will be used to determine whether the patient meets inclusion criteria, and was not excluded for a number of specified reasons. The data will be collected in a confidential manner in a secure, private location, using the instrument identified and data analysis will be used as identified in the chapter, thereby, determining whether the type and amount of narcotic administered in the PACU is associated with the length of stay and the postoperative pain level and intensity, reported by

the patient, at the time of discharge to home for patients who have undergone a laparoscopic cholecystectomy.

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